

gest further that physicians at large could profitably give less attention to the history of infection and the serum Wassermann test and more attention to the spinal fluid test and to the physical and especially the neurological and ophthalmic findings in their effort to recognize late syphilis and to interpret the medical picture presented by a given patient.

COMPARISON OF DUPLICATE SURVEYS OF TWO GROUPS OF FIFTY RAILROAD MEN EACH, AND ONE GROUP OF ONE HUNDRED FARMERS.

	Railroad men.		Farmers. Per cent
	First series. Per cent	Second series. Per cent	
Cerebrospinal fluid positive . . . . .	64.0	79.0	51.7
Lues, central nervous system . . . . .	79.5	83.0	68.5
Lues III, cardiovascular . . . . .	18.7	20.0	12.0
Blood Wassermann negative . . . . .	57.0	58.0	43.0
Blood Wassermann positive . . . . .	43.0	42.0	50.0
Wassermann weak positive . . . . .	4.0	2.0	7.0
Use of alcohol . . . . .	75.0	61.0	55.0
Heavy drinkers . . . . .	36.0	33.0	32.0
History of lues II unobtainable . . . . .	62.5	60.0	60.0
Lues recognized at some time . . . . .	55.0	57.0	
Age of onset late symptoms—over thirty . . . . .	78.0	75.0	70.7
Gonorrheal history positive . . . . .	80.0	73.0	52.0
Gonorrhea only . . . . .	24.0	19.0	12.0
Symptoms appearing from six to twenty after infection . . . . .	71.0	67.0	46.0
Percentage infected by the age of thirty-two years . . . . .	91.0	81.0	77.0
Wassermann on men under twenty-five years will reach . . . . .	70.0	60.0	61.0
Sterile or pathologic marriages . . . . .	44.0	50.0	32.0 (of 59)
Age on entry—patients between thirty-five and forty years . . . . .	32.0	36.0	19.0
Concerned in operation of trains . . . . .	76.0	70.0	
Concerned in operation of engines . . . . .	36.0	36.0	

SYMPTOMATOLOGY.

Gastric . . . . .	28.0	22.0	25.0
Not suggestive of lues . . . . .	18.0	24.0	8.0
Headaches and head pains . . . . .	16.0	16.0	13.0
Cardiac . . . . .	14.0	16.0	4.0
Diplopia and poor vision . . . . .	14.0	10.0	16.0
Malaise, weakness . . . . .	12.0	8.0	10.0
Shooting pains . . . . .	10.0	20.0	19.0
Bladder (subjective) . . . . .	10.0	4.0	13.0
Nervousness . . . . .	8.0	4.0	
"Do I have syphilis?" . . . . .	8.0	6.0	4.0
Laryngeal . . . . .	8.0	0.0	4.0
Rheumatism . . . . .	4.0	18.0	7.0
Ataxia (subjective) . . . . .	4.0	6.0	13.0
Girdle pain . . . . .	4.0	4.0	16.0 (paresthesia)
Dizziness . . . . .	2.0	8.0	13.0
Loss of consciousness . . . . .	.....	7.1	10.4

## OBJECTIVE EXAMINATION.

Abnormal knee reflexes . . . . .	65.1	79.0	73.7
Abnormal Achilles reflex . . . . .	78.1	62.0	61.9
Romberg positive . . . . .	38.0	42.0	50.7
Speech defect . . . . .	15.7	17.0	11.0
Mental symptoms . . . . .	38.4	38.0	41.6
Paresthesias . . . . .	55.8	51.3	41.0
Ataxia (objective) . . . . .	36.8	36.3	41.0
Bladder (objective) . . . . .	47.5	20.5	31.0

## EYE FINDINGS.

"Slow" reflexes . . . . .	25.0 per cent. of 48 cases	21.7 of 78 cases.
Argyll-Robertson pupils . . . . .	37.0 " " 48 "	32.0 of 78 "
Unequal pupils . . . . .	14.5 " " 48 "	23.8 of 67 "
Irregular pupils . . . . .	14.5 " " 48 "	26.8 of 67 "
Muscular paralyses . . . . .	12.5 " " 48 "	10.5 of 37 "
Fundus changes . . . . .	26.5 " " 34 "	4.4 of 67 "

## THE HEART IRREGULARITY CALLED "SINO-AURICULAR BLOCK."

By S. CALVIN SMITH, M.S., M.D.,

PHILADELPHIA.

**Introduction.** While examining recruits to determine their cardiovascular fitness for military service, my attention was attracted by a

## A

**EXHIBIT A.** A Normal Electrocardiogram. (Presented for comparison with the illustrations which follow.) The *P* wave, which is the representative of auricular activity, is followed by the ventricular complex *Q-R-S-T*. The *R* wave represents initial activity at the base of the ventricles; the *T* wave is believed to represent final activity at the base of the ventricles. From the ending of the *T* wave to the beginning of the *P* wave is the rest period of the heart. Normally, each *T-P* or diastolic period is equal in length or nearly so. In the condition called "sino-auricular block" the *T-P* interval suddenly becomes of a length much greater than the usual rest-period between heart-beats.

form of heart irregularity which frequently appeared following exercise in healthy youths of the athletic type. The exercise test which was prescribed for cardiovascular examinations consisted in hopping

100 times on one foot; such effort could be expected to raise the pulse-rate approximately forty beats, and the healthy heart returned to its preëxercise-rate well within the time-limit of two minutes. The majority of the pulse-rates returned to the preëxercise status by a gradual decline in rate. There were some instances, however,

## B

EXHIBIT B. The Heart Irregularity Called "Sino-auricular Block." Five-year-old Child; Record Taken Three Months After Illness from Diphtheria. "A peculiar disturbance of the heart's action, . . . consisting of dropped beats, . . . in which the auricular beat is lost as well as the ventricular. The rhythmic action of both auricle and ventricle is disturbed by a cycle of unusual length, the long cycle being approximately the length of—usually somewhat shorter than—two normal cycles. It is ushered in by slight quickening of the whole heart and is succeeded by cycles which, while at first a little long, shorten up until the usual length of the cycle is reëstablished. . . . The *P-R* interval is usually prolonged but shortens again after each long diastole."\*

## C

EXHIBIT C. Sinus Arrhythmia. Sinus arrhythmia, which is physiological in childhood, may be confused with "sino-auricular block" unless one remembers that in sinus arrhythmia the rate gradually decreases on expiration and increases on inspiration (as noted in the above figure). Also in sinus arrhythmia the irregularity disappears when the breath is held; but in "sino-auricular block" holding the breath causes no change in the "dropping" of beats.

in which this gradual decline in rate did not occur; the pulse would fall precipitately from a rate of 132 in the first ten seconds following exercise to a rate of perhaps 98 twenty seconds afterward; ten seconds later the pulse might mount to 120; such oscillations in rate-return would continue until the preëxercise-rate was reached and maintained. It was customary for some of the army examiners

\* Quoted from Lewis's Mechanism and Graphic Registration of the Heart-beat, 1920.

to refer to the pulse which gradually declined as "a pulse that slid down;" the other variety was described as "a pulse that skipped

D

EXHIBIT D. Auricular Premature Contractions. Premature contractions originating in the auricles produce an irregularity which on casual glance may simulate that of "sino-auricular block." On closer inspection, however, it will be observed that the *P* (auricular) wave is either changed in direction ( $P^L-P^N$ ) or buried in the *T* wave of the preceding ventricular complex ( $P^N$ ). It is also usual to find that the *period of disturbance plus the distance of the subsequent compensatory pause* is not equal in length to the distance of two uninterrupted cardiac cycles.

E-1

E-2

EXHIBIT E. "Sino-auricular Block" Probably Due to Atropin. Four-year-old child acutely ill with diphtheria. The irregularity was not present on admission to the hospital (Fig. E-1), but was manifest twenty minutes after the hypodermic administration of strychnin 0.01 gr. and atropin 0.0067 gr. (Fig. E-2). Rate of Fig. 1, 130. Rate of Fig. 2 approximately, 105. Within an hour the irregularity had disappeared.

down" to the preëxercise-rate. This "skipping" form of arrhythmia during the rate-return from exercise was rather frequently

encountered and a line was given to it in our printed cardiovascular blank records in order that the irregularity might be properly appraised. Inquiry developed the facts that this type of arrhythmia was not present before exercise, not present during sustained physical effort, not present in the quiet hours of physical rest, not noticeable

## F

EXHIBIT F-1. "Sino-auricular Block," Eighth Day of Convalescence. The pulse irregularity which the resident physician had discovered in a diphtheria convalescent eight years of age all but disappeared at the time of the electrocardiographic study: Lead II, however, shows an isolated instance of sino-auricular block. Heart-rate, 112.

## F—2

EXHIBIT F-2. Same Patient as Exhibit F-1; Patient Dozing. "Sino-auricular block" appeared every third or fourth beat, in all three leads. Heart-rate averages 75.

when the patient was dozing off to sleep—the arrhythmia was evidently not present at any other time than following the return of rate from forced and sudden exercise. Needless to say, in such recruits there was no evidence of cardiocirculatory damage or they would not have been accepted for service.

**The Irregularity in Convalescence.** Upon return to civil practice and during a series of studies at a hospital for contagious diseases I noted the same type of pulse irregularity in children—present, however, under conditions other than exercise. This irregularity could be identified electrocardiographically as “sino-auricular block.” (See Exhibit B.) Being noticed for the most part in children who were in the diphtheria ward the irregularity was naturally

G

EXHIBIT G-1. Same Patient as Exhibit F; Child Mentally Stimulated. The irregularity was made to disappear by exercising the patient. Rate, 128.

G—2:

EXHIBIT G-2. Same Patient as Exhibit F; Day before Discharge. The throat cultures were finally negative and the child was told that he would be sent home. He was not inclined to go and was pensive when these records were taken. “Sino-auricular block” is most apparent in all leads. Heart-rate averages 75.

believed to be of pathological significance and perhaps premonitory of higher grades of heart-block. However, as the electrocardiographic records began to accumulate (see Exhibits E, F, G, H) it was noticed that “sino-auricular block” almost invariably occurred (with the sole exception of Exhibit E) in children who were convalescent from diphtheria, the duration of convalescence ranging from the second week to the third month of hospitalization. The children

were free from any evidence of cardiocirculatory fault other than this evanescent form of arrhythmia—they were convalescents kept in the hospital either in order that the arrhythmia could be watched or else because the throat cultures were not yet negative following the attack of diphtheria.

## H

EXHIBIT H-1. "Sino-auricular Block." The six-year-old girl was contentedly resting when the records were taken. Sino-auricular block is marked through all the leads. Rate averages 75.

## H—2

EXHIBIT H-2. Same Child as H-1; patient fretting: "Sino-auricular block" disappeared from the record. Rate 105.

In the patient from whom Exhibits F and G were taken it was noticed that the arrhythmia could be made to appear or made to disappear in the manner stated in the legends below these records. Exhibit H shows the occurrence of "sino-auricular block" due to emotional disturbance alone. It is to be remembered that the convalescent children from whom these records were taken were not receiving any cardiac drugs. Exhibit E, however, shows "sino-auricular block" twenty minutes after the hypodermic administra-

tion of strychnin and atropin, thus suggesting that the latter drug is, in all probability, capable of producing a slowing in heart-rate (from 130 to 105) by the production of "sino-auricular block"—perhaps by its action on the vagus center.

The observations so far made might lead one to conclude that "sino-auricular block" is an irregularity which in children is the result of or in some way associated with the toxins of diphtheria. That such is not the case is shown in Exhibit I, which record was taken from a child convalescing from an attack of mumps. Another

## I

EXHIBIT I. Mumps: Fourteenth Day After Parotid Swelling was Noticed. A six-year-old child, apparently well, yielded the above record of "sino-auricular block."

## J

EXHIBIT J. Whooping-cough: Thirteenth Day. A four-year-old child, between paroxysms of coughing, presented "sino-auricular block" in the electrocardiogram.

youngster, suffering from whooping-cough, yielded Exhibit J between infrequent paroxysms of coughing, indicating that "sino-auricular block" may be one of nature's methods of slowing the heart-rate when the heart-rate is for any reason accelerated—as it was accelerated, in this instance, by violent paroxysms of coughing.

**The Irregularity in Health.**—In further support of the observation that "sino-auricular block" is probably natural to certain hearts, much as that other irregularity, sinus arrhythmia, is physiological in childhood, Exhibit K is offered in evidence. The records were



taken from a buoyant, active child of eight years. After hopping 100 times on one foot there was noted the same type of arrhythmia as had been so frequently observed in military practice following the return of the heart-rate from exercise.

This particular record, K-2, is not so characteristic of sino-auricular block as are other of the illustrations; it may be contended that K-2 is an exaggerated sinus arrhythmia. If it proves to be so it illustrates that the border-line between the two conditions is not closely drawn and that one may merge into the other, thus placing

K-1

K-2

EXHIBIT K. Healthy Child of Eight Years Before and After Exercise. After hopping 100 times on one foot an irregularity resembling "sino-auricular block" appeared in the record.

both "sino-auricular block" and sinus arrhythmia on the same physiological plane. The record (K-2) seems capable of sino-auricular interpretation under the analysis given by Lewis, which follows:

"A peculiar disturbance of the heart's action, . . . consisting of dropped beats, . . . in which the auricular beat is lost as well as the ventricular. The rhythmic action of both auricle and ventricle is disturbed by a cycle of unusual length, the long cycle being approximately the length of—usually somewhat shorter than—two normal cycles. It is ushered in by slight quickening of the

whole heart and is succeeded by cycles which, while at first a little long, shorten up until the usual length of the cycle is reestablished. . . . The *P-R* interval is usually prolonged but shortens again after each long diastole."<sup>1</sup>

Another record from an apparently normal youth of nineteen years is shown in Exhibit L. His previous history was negative, but he had accidentally discovered that a pulse irregularity was

L—1

L—2

EXHIBIT L. Healthy Youth of Nineteen Years; Before and After Exercise. After 100 hops on one foot an irregularity resembling "sino-auricular block" appeared in the record.

fleetingly present at times when he was resting from a dance. After hopping 100 times on one foot the irregularity was recorded in Exhibit L-2. Weighed in the balance of judgment, Exhibit L-2 tips the scales to sinus arrhythmia, again illustrating the resemblance between sinus arrhythmia and "sino-auricular block." Exercise did not produce any cardiocirculatory distress in the child of eight years nor in the youth of nineteen years. Neither one at any time

<sup>1</sup> Lewis, Thomas: Mechanism and Graphic Registration of the Heart-beat, 1920.

had symptoms or physical signs of cardiocirculatory fault, nor was there any history of circulatory embarrassment; yet both exhibited an irregularity following the exercise test of hopping 100 times on one foot. Evidently "sino-auricular block" is a phenomenon natural to certain hearts as the pulse-rate returns to normal from the stimulation of exercise. I have also recorded the irregularity in the mother heart, in records taken during the tranquil period which follows the birth of the child.

**Literature.** It is generally understood that "sino-auricular block" is a low grade heart-block, as capable of eventuating in block of higher grade as is any other low-grade interference with the passage of the impulse for contraction in its course along the conduction system from the pacemaker to the fibers of Purkinje. The literature on the subject is not extensive. Paul White,<sup>2</sup> in reporting one of seven cases seen at the Massachusetts General Hospital in the past five years, presents records of a healthy athlete who exhibited "sino-auricular block" after exercise, and quotes Levine<sup>3</sup> as having noted the condition in four patients, three of whom had been taking digitalis. Levine collected fourteen cases from the literature, in seven of which there was the history of digitalis administration. Brown<sup>4</sup> reported a patient, eleven years of age and suffering from acute arthritis, in which atropin abolished "sino-auricular block."

**Conclusions.** 1. "Sino-auricular block" is not as rare as the paucity of literature on the subject would lead one to believe. It was clinically suspected, with some degree of certainty, in scores of healthy young men in military examinations; it has been cardiographically proved to be present fourteen times in the last ten months of the writer's experience.

2. "Sino-auricular block" can be clinically suspected in a person whose pulse is irregular as the rate returns to normal after exercise and who is free from symptoms and signs of circulatory fault. The condition is to be differentiated from sinus arrhythmia and from premature contractions; in sinus arrhythmia the rate increases on inspiration and decreases on expiration, the irregularity disappearing when the breath is held. Respiration has no effect on the irregularity called "sino-auricular block." Premature contractions may be associated with other evidence of cardiocirculatory fault; they disappear on exercise and do not usually recur for several minutes following increased physical effort; they are especially noticeable when the patient is at physical rest or falling asleep. A person whose heart exhibits premature contractions (particularly if they be of ventricular origin) is usually conscious of the irregularity; the intermittency of "sino-auricular block" produces no such subjective symptoms.

<sup>2</sup> Arch. Int. Med., 1920, xxv, 420.

<sup>3</sup> Ibid., 1916, xvii, 153.

<sup>4</sup> Ibid., 1919, xxiv, 458.

3. "Sino-auricular block" is not associated with nor is it the sequel of any one definite type of infective process.

4. It is not necessarily dependent upon nor secondary to an infective process, as it occurs in individuals who are well.

5. In a rapid heart it was recorded within twenty minutes following the hypodermic administration of strychnin and atropin.

6. It has been observed in persons who had no other clinical evidence or physical signs of cardiocirculatory disturbance.

7. "Sino-auricular block," in certain persons, can be made to appear following physical exertion, mental excitement or emotional strain; it may also follow the administration of drugs; it is therefore likely due to a change in nerve control of the heart.

8. In seven of the eight patients whose electrocardiographic records are here shown there was no other evidence of cardiac disturbance in the graphic records (the exception being Exhibit H-2, which shows inversion of lead III).

9. The premises above enumerated lead to the deduction that "sino-auricular block" is not a pathological condition, but is, in all likelihood, a physiological manifestation in certain hearts. As such its detection does not require drug interference nor does it furnish an indication for modifying the individual's accustomed manner of living.

## BACTERIA ON SUBSIDIARY COINS AND CURRENCY.

BY CHARLOTTE B. WARD, B.S.,

AND

FRED W. TANNER, PH.D.

URBANA, ILL.

(Contribution from the Laboratories of General Bacteriology of the University of Illinois, Urbana, Ill.)

THE object of this investigation was to determine the numbers and types of microorganisms on the coins and currency being used in general circulation. The smaller values were used, since it was believed that these were passing more quickly from one person to another. The significance of contact infection and infection by means of the hand has been well emphasized by many recent investigations. Money is a medium which is received from all kinds of individuals, often with little regard that it may be a carrier of infection.

Very little data are available from which to draw conclusions with regard to the significance of coins in this relation. Most of the studies have been concerned with the pathogenic bacteria, and no study seems to have been made to determine just what types of organisms are present on the coins. Some of the information